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**INVESTMENT POLICY, INTERNAL FINANCING
AND OWNERSHIP CONCENTRATION IN THE UK**

By Marc Goergen and Luc Renneboog

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Investment policy, internal financing and ownership concentration in the UK.

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ABSTRACT

This paper investigates whether investment spending of firms is sensitive to the availability of internal funds. Imperfect capital markets create a hierarchy for the different sources of funds such that investment and financial decisions are not independent. The relation between corporate investment and free cash flow is investigated using the Bond and Meghir (1994a) Euler-equation model for a panel of 240 companies listed on the London Stock Exchange over a 6 year period. This method allows for a direct test of the first-order condition of an intertemporal maximisation problem. It does not require the use of Tobin's q , which is subject to mis-measurement problems. Apart from past investment levels and generated cash flow, the model also includes a leverage factor which captures potential bankruptcy costs and the tax advantages of debt. More importantly, we investigate whether ownership concentration by class of shareholder creates or mitigates liquidity constraints.

Control is expected to influence the investment financing relation for two reasons. First, due to asymmetric information, the link between liquidity and investment could be a symptom of underinvestment. Firms pass up some projects with positive net present values because of the inflated cost of external funds. Second, from an agency perspective, external funds may not be too expensive but internal funds (free cash flow) may be too inexpensive from the manager's perspective. Whereas high insider ownership concentration reduces the liquidity constraints induced by agency costs, high insider shareholding concentration increases the liquidity constraints in the case of asymmetric information. It is expected that the induced liquidity constraints due to insider ownership is substantially reduced when outside investors control a substantial share stake and have therefore an increased propensity to monitor management. When industrial companies control large shareholdings, there is evidence of increased overinvestment. This relation is strong when the relative voting power (measured by the Shapley values) of the combined equity stakes of families and industrial companies and the Herfindahl index of industrial ownership are high. This suggests that a small coalition of industrial companies is able to influence investment spending. In contrast, large institutional holdings reduce the positive link between investment spending and cash flow relation and hence suboptimal investing. Whereas there is no evidence of over- or underinvesting at low levels of insider shareholding, a high concentration of control in the hands of executive directors creates a positive investment-cash flow relation.

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Key words: Investment, liquidity constraints, ownership, control, corporate governance

JEL classification: G32, G34

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Investment policy, internal financing and ownership concentration in the UK.

1. Introduction.

In perfect capital markets, investment decisions are independent of financing decisions and, hence, investment policy only depends upon the availability of investment opportunities with a positive net present value (NPV) (Miller and Modigliani 1958). In the standard neo-classical model of investment, firms have unlimited access to sources of finance and invest as long as the marginal dollar of the capital expenditure generates at least one dollar of a present value of cash flows (Tobin 1969). Consequently, firms with profitable investment opportunities exceeding available cash flow are not expected to invest any less than firms with similar opportunities but larger internal cash flows.

However, the empirical literature supports the model about the hierarchy of financing which predicts that the investment expenditure of some firms may be constrained by a lack of internally generated funds. For many firms, the cost of external capital does indeed seem to exceed the cost of internal funds. As profits are highly cyclical, the existence of liquidity constraints makes investment spending more sensitive to fluctuations in economic activity. Differing views on the riskiness of investment projects between shareholders and management and hence on the relevant discount rate may result in good investment projects being rejected.

Underinvestment due to asymmetric information (Greenwald et al. 1984) results from the fact that the market requires – even for high quality firms/projects – a premium equal to the one required for investing in the average firm. Consequently, due to adverse selection, it may be the (relatively) lower quality projects which may seek external financing and some positive NPV projects are not undertaken at all.¹ Myers and Majluf (1984) have labelled the hierarchy of financing - driven by asymmetric information and/or the real direct and indirect costs of different sources of financing - the pecking order theory. Firms finance positive NPV projects in the first instance with internal financing, subsequently with debt (as the least risky form of external financing) followed by all kinds of hybrid debt with equity components and finally with external equity as a last resort.

¹ This adverse selection process is similar to Akerlof's 'lemons market'.

Consequently, a positive relation between investment and liquidity may result from asymmetric information because the lack of internal capital and the ‘high cost’ of external capital create an *underinvestment* problem. However, this positive relation may also be the consequence of an abundance of retained earnings which makes internal funds too inexpensive (from the management’s point of view). In firms with insufficient monitoring mechanisms – e.g. in firms without performance-related managerial remuneration schemes, with diffuse ownership, with anti-takeover devices or with CEO dominated boards of directors – high managerial discretion may lead to considerable agency costs. In such cases, managers’ interests are not perfectly aligned with those of the shareholders (Jensen 1986, Bernanke and Gertler 1989): managerial decision-making may be motivated by ‘empire building’ and lead to *overinvestment*. In this setting, managers may place a discount on internal funds and overspend by undertaking even negative NPV projects as long as there is excessive liquidity² in the firm because managers may derive more private benefits by increasing their firm’s size (Hart and Moore 1995).

The question whether or not the level of investment depends on corporate liquidity, has drawn substantial attention over the last decade since the seminal paper by Fazzari, Hubbard and Petersen (1988) has rekindled the interest in the determinants of investments. However, relatively few papers test the investment-liquidity relation within a specific corporate governance framework. Notable recent exceptions are e.g. Kathuria and Mueller (1995), Kaplan and Zingales (1997), Hadlock (1998), Gugler, Mueller and Yurtogly (1999), Vogt (1994) and Cho (1998) for the US, Degryse and deJong (2000) for the Netherlands, Haid and Weigand (1998) for Germany, and Gugler (1999) for Austria.

This paper focuses on the impact of relative voting power and liquidity on investment spending in UK firms. The empirical version of the Bond and Meghir (1994a) Euler-equation model is extended by including variables capturing ownership concentration and shareholder coalition to answer the following questions. Are UK firms liquidity constrained? Does the presence of specific classes of shareholders influence the relation between investment spending and internally generated funds? Do shareholder coalitions influence the investment-cash flow relation in firms with dispersed ownership? Are companies with high leverage more liquidity constrained?

² Excessive liquidity may be defined as the total cash stock of a firm minus the cash component of working capital, minus cash necessary for all compulsory payments (debt, payables, taxes) and minus cash invested in positive NPV investments.

The remainder of the paper is structured as follows. Section 2 presents the hypotheses and embeds them in the literature. Section 3 describes the data and explains the methodology. Section 4 discusses the results and section 5 concludes.

2. Models on liquidity constraints and hypotheses.

2.1 Types of investment models.

In the literature, empirically testable models of company investment can be categorised into four broad classes. The four classes are the neoclassical model, the sales accelerator model, the Tobin's q model and the Euler-equation model. In the neoclassical model, the relative cost of capital is the main determinant of corporate investment (see e.g. Jorgenson 1963 for an overview). The model is defined as:

$$\left(\frac{I}{K}\right)_{it} = \alpha_i + \alpha_1 \left(\frac{C_K}{K}\right)_{it} + \alpha_2 \left(\frac{C_K}{K}\right)_{i,t-1} + \alpha_3 \left(\frac{CF}{K}\right)_{it} + \epsilon_{it} \quad (1)$$

where I stands for the investment level, K for the capital stock, C_K for the cost of capital and CF for cash flow. The coefficients α_1 and α_2 give cash flow sensitivities for firm i and ϵ_{it} is the error term. Although today's investment generates tomorrow's output, the model does not include any forward-looking variables.

Similarly, the sales accelerator model (Abel and Blanchard 1986) does not include expectations about the company's growth potential³ and assumes that investment grows along with total sales:

$$\left(\frac{I}{K}\right)_{it} = \alpha_i + \alpha_1 \left(\frac{S}{K}\right)_{it} + \alpha_2 \left(\frac{S}{K}\right)_{i,t-1} + \alpha_3 \left(\frac{CF}{K}\right)_{it} + \epsilon_{it} \quad (2)$$

where S stands for total sales.

A more fundamental criticism of these two types of model is that a positive relation between investment and cash flow is assumed to be evidence of liquidity constraints. However, a positive cash flow coefficient may not reflect the importance of internally generated funds for investment purposes, but could instead indicate higher future profitability.

³ Fazzari et al. (1988) test alternative versions of the sales accelerator model by adding Tobin's q to equation (2). They show that the inclusion of Tobin's q diminishes the effect of the cash flow variable, although the latter remains still significant.

Investment is likely to depend not only on the current level of optimal capital stock but also on its future, optimal level (Bond and Meghir 1994b). As data on expectations are not available, the relation between investment decisions, expected future levels of output and the hurdle rate (the minimum required rate of return to accept investment projects) cannot be estimated. The inclusion of current and lagged levels of output and hurdle rate into investment models is not a proper solution because no distinction is made between factors influencing the optimal capital stock (the level of capital for which the marginal product of capital equals the hurdle rate) and factors which forecast the future value of the capital stock. Therefore, the cash flow variable of the above investment equations could reflect either financial constraints or the formation of expectations.

Models incorporating Tobin's q (defined as the ratio of market values of equity and debt over the replacement value of the firm's capital stock) have attempted to solve this problem as the expectation of future profitability is captured by the forward-looking stock market valuation (see e.g. Abel 1990):

$$\left(\frac{I}{K}\right)_{it} = g_i + g_1 Q_{it} + g_2 \left(\frac{CF}{K}\right)_{it} + e_{it} \quad (3)$$

where Q_{it} stands for Tobin's q and γ_i is the investment for firm i needed to generate future profitability, which is reflected in Q . If firms are not financially constrained γ_2 is expected to be equal to zero, otherwise γ_2 will typically be different from zero.

However, estimating q -models is not without problems for various reasons. First, Tobin's q is difficult to measure: the replacement value of assets is not reported in most European countries. Proxying the denominator of Tobin's q by book value of assets also suffers from estimation problems such as the measurement of intangibles. Second, Tobin's q will only include future expectations if the firm is a price taker in perfectly competitive industries, if there are constant returns to scale and if the stock market value correctly measures the fundamental expected present value of the firm's future net cash flows (Hayashi 1982). In practice, these conditions may not be fulfilled, e.g. if the stock market displays excessive volatility relative to the fundamental value of the companies. Thus, if cash flow (or profitability) variables are included in an investment model along with Tobin's q , these cash flow variables may still be made up of expectations not captured by Tobin's q . It may then be difficult to disentangle the effect of expectations from the one of liquidity constraints in the parameter estimate of the cash flow variable. Chirinko and Schaller (1995) show that average Tobin's q is flawed as it reflects the average return on a company's total capital whereas it is the marginal return on capital that is

relevant. Gugler, Mueller and Yurtoglu (1999) develop a technique to measure marginal Tobin's q and test the degree of cash flow sensitivity to investment in different Tobin's q scenarios to distinguish between cases with asymmetric information and agency conflicts.

The Euler-equation model of Bond and Meghir (1994a and 1994b) (hereafter called B&M) is based on the first-order conditions of a maximisation process. The model deals with the shortcomings of the neoclassical and average Tobin's q -models. The level of investment relative to the capital stock is a function of discounted expected future investment adjusted for the impact of the expected changes in the input prices and net marginal output. The Euler specification has the advantage that it controls for the influence of expected future profitability on investment spending whilst no explicit measure of expected demand or expected costs is required as future unobservable values are approximated by instrumental values. The theoretical model translates into the following empirical specification and tests the wedge between retained earnings and outside financing:

$$\left(\frac{I}{K}\right)_{it} = a_1 \left(\frac{I}{K}\right)_{i,t-1} + a_2 \left(\frac{I}{K}\right)_{i,t-1}^2 + a_3 \left(\frac{CF}{K}\right)_{i,t-1} + a_4 \left(\frac{S}{K}\right)_{i,t-1} + a_5 \left(\frac{D}{K}\right)_{i,t-1} + y_i + j_i + e_{it} \quad (4)$$

where D stands for the debt of the firm, ψ_t and ϕ_i stand for time specific effects and fixed effects respectively and all the other symbols are as previously defined.⁴

2.2 Hypotheses.

Empirical attempts to answer our first question - whether or not investment activity is influenced by movements in generated profits (or cash flow) – have a long history and date back to the business cycle research of Tinbergen (1939) and Meyer and Kuh (1957). Both studies found evidence that financial profitability influences investment decision in the short run. Although these and many other studies have interpreted such findings as evidence of the hierarchy of financing theory, the results could as well imply that liquidity variables are a proxy for omitted variables. We try to control for the latter possibility by using the Generalized Method of Moments

⁴ As the time series for I/K is relatively short (1988-1993) it may be influenced by the economic slow down of the UK economy in this period. As I/S (Investment standardised by Sales) is more stable over time, Steve Bond suggested to test also the following variant of the B&M model. We are grateful for this suggestion.

$$\left(\frac{I}{S}\right)_{it} = a^1 \left(\frac{I}{S}\right)_{i,t-1} + a^2 \left(\frac{I}{S}\right)_{i,t-1}^2 + a^3 \left(\frac{CF}{S}\right)_{i,t-1} + a^4 \left(\frac{D}{S}\right)_{i,t-1} + y_i + j_i + e_{it} \quad (5)$$

in Systems (GMM_{sys})⁵ rather than OLS. Within this econometric setting, we hypothesise that *there is no relation between a firm's investment decision and its cash flow stock (hypothesis 1)*.

Over the past decade – since Fazzari et al. (1988) have triggered renewed interest in financing constraints and investment activity by testing the neo-classical, sales accelerator and Tobin's q models – the above null hypothesis has been frequently rejected. The standard approach in the literature has been to test the above models on subsamples of firms which are supposed to be liquidity constrained, e.g. firms with low dividend pay-out ratios and new equity issues. Fazzari et al. (1988) find that the sensitivity of capital expenditure with respect to cash flow fluctuations is highest for fast growing and/or low-dividend firms. However, strong criticism about this study and related articles was formulated by Kaplan and Zingales (1995). They collected additional quantitative and qualitative information on financing constraints for the Fazzari et al. sample. The analysis of subsamples with varying degrees of financing constraints yields results contrary to those of Fazzari et al.: the higher the likelihood that the companies face financial constraints the lower their investment-cash flow sensitivity.⁶

Several papers have since then extended investment models by incorporating different sources of funds such as working capital (Fazzari and Petersen 1993). They find that the investment-cash flow sensitivity is significantly positive but the coefficient on working capital changes is significantly negative, reflecting that working capital seems to compete for funds with fixed investment. Carpenter (1995) further extends this model by adding changes in debt level and finds evidence of significant financing constraints in firms with low growth opportunities (low Tobin's q) and with low dividend pay-out ratios.

Furthermore, the investment-cash flow relation may be influenced by the concentration and nature of ownership. Managerial discretion may be curbed if shareholders assume an active monitoring role, which reduces overinvestment and is reflected in no or a smaller investment-cash flow relation. Likewise, the positive investment-cash flow relation may be reduced in the presence of large corporate blockholders. For example, Hoshi, Kashyap and Scharfstein (1991) distinguish between two samples of Japanese firms, the ones that belong to a keiretsu group and those that are independent. Hoshi et al. investigate whether or not keiretsu membership has an impact on the

⁵ This estimation technique controls for the potential omitted variables problem by using lagged variables as instruments.

⁶ Fazzari, Hubbard and Petersen (1996) respond by pointing out a number of inconsistencies in the Kaplan and Zingales methodology and reasoning and mention the arbitrariness of the criteria used for forming subsamples with different degrees of financing constraints.

access to external capital. Keiretsu firms are expected to face fewer or no liquidity constraints because the keiretsu usually comprises financial institutions which can provide soft loans for investments. The results suggest that firms belonging to a keiretsu are less susceptible to financing constraints.

This raises the question whether or not shareholders play an active governance role. There is some, albeit limited, empirical evidence of large shareholder monitoring for the UK. Industrial and commercial companies as well as individuals and families (not related to a top manager) who own share blocks or build up large shareholdings discipline incumbent management in the wake of a performance decline and in the absence of managerial entrenchment (Franks et al. 1998, Lai and Sudarsanam 1997, Lasfer 1995). Monitoring will only be cost effective if a single shareholder or a coalition of shareholders becomes large enough to internalise the costs of corporate control. A small shareholder pays all the costs related to his control efforts but benefits only in proportion to his shareholding (Grossman and Hart 1980, Demsetz, 1983). Using power indices to measure relative control, Leech (2000) shows that, given the dispersed ownership structure of UK firms, the equity stake needed to incite a shareholder to actively participate in monitoring is not that large. Three to four percent of ownership in the average company may suffice.

The positive relation between internally generated funds and investment may not be present or may be less strong in the presence of a large outside shareholder for two reasons. First, the problem of overinvestment may be reduced by enhanced monitoring which decreases the squandering of free cash flows by management. Second, asymmetric information between management and large shareholders may decrease if it pays for the large shareholder to spend time and effort to collect more accurate information on the management's quality and its investment projects. Hence, we will test whether *in the presence of a large outside share block held by an industrial or commercial company, or an individual or family not related to a director, a (positive) relation between investments and cash flow is absent (hypothesis 2)*. Institutional investors are the largest owners of firms listed on the London Stock Exchange. However, institutions have been reproached by the Cadbury (1992), Hampel (1998) and Newbold (1999) corporate governance committees to be passive investors. Stapledon (1996), Goergen and Renneboog (2000), and Faccio and Lasfer (2000a) confirm that institutions do not normally intervene in a company's business for two reasons. First, they may lack the monitoring expertise. Second, they may want to ensure investment liquidity as insider-trading regulation may immobilise

portfolio rebalancing. In contrast, recent anecdotal evidence seems to suggest that, even if institutional shareholders do not publicly intervene, they act behind the scenes. Moreover, surveys on the actual voting behaviour of investment funds reveal that vote casting by institutions has been growing rapidly (Mallin 1996). Some institutions have even established voting policies which compel them to cast their votes on e.g. managerial investment decisions in firms where they hold an equity stake of 3% or more (for examples, see Mallin 1999). Hence we formulate our null hypothesis as follows: *for companies in which institutional shareholders own large ownership stakes, there is no relation between investment and internally generated funds (hypothesis 3).*

Managerial ownership can be used as a proxy for the alignment of interests between managers and shareholders. However, the relationship between insider holdings and the alignment of shareholder and managerial interests may be non-monotonic as suggested by Morck et al. (1988) and McConnell and Servaes (1990). At low levels of insider ownership, increases in managerial ownership may lead to a convergence of interest whereas high levels of insider ownership may result in managerial unaccountability due to entrenchment (Franks et al. 1998, Faccio and Lasfer 2000b). Consequently, increases in managerial shareholdings when managerial shareholdings are low may lead to diminished investment-cash flow sensitivities because of less overinvesting. Conversely, an increased sensitivity is expected when managerial ownership increases and is already large, which may lead to overinvesting. This reasoning hinges on Jensen's (1986) a free cash flow argument resulting from the existence of agency costs.

The predictions about the investment-cash flow sensitivity in the context of managerial ownership are different under asymmetric information. Inferior knowledge about the quality of the management and its investment decisions by the capital markets may be the reason why a premium on external capital is required and why an underinvestment problem arises. When insider ownership grows and managerial interests become more and more aligned with those of the other shareholders, managers internalise more of the mispricing of external funds (Hadlock 1998). Consequently, the underinvestment problem becomes worse as managers are increasingly reluctant to reward external capital with an excessive premium. Investment will rely even more on the availability of internal funds and hence – at low levels of insider ownership – the investment-cash flow sensitivity rises with increasing levels of insider ownership.

In summary, *insider ownership does not influence the investment-cash flow relation (null hypothesis 4). Alternatively (in an agency context), at low levels of insider holdings, high free cash flow will entail fewer investments when insider ownership increases because of increasing alignment of interest of managers and other shareholders. At high levels of insider holdings*

(leading to managerial entrenchement), free cash flow leads to more investments. In an asymmetric information setting, investment-cash flow sensitivity increases with insider ownership.

2.3 Measurement of control concentration.

A priori, one would in general expect little shareholder monitoring in the UK as most listed industrial companies (85%) are widely-held, i.e. lacking a controlling share block in excess of 25%. Bebchuk and Roe (1999) argue that diffuse ownership persists – in spite of its inherent drawbacks in terms of agency costs – as a result of historic regulatory evolution (structure- and regulation-driven path dependence). For example, for investors who are not interested in acquiring a complete company, the mandatory take-over threshold of 30% is an upper boundary (Goergen and Renneboog 2000).

However, agency costs between management and shareholders may be lower than expected if shareholders can increase control power by forming voting coalitions. Such coalitions are formed on an ad hoc basis because if a coalition were to be formed for longer periods of time, regulatory authorities would consider the coalition as an investor group.⁷ Consequently, voting coalitions are usually temporary and are customarily forged with a specific aim (e.g. the removal of incumbent management). They are also commonly kept confidential, although explicit voting contracts may be drawn up (Van Hulle 1998).

In the B&M investment model described above, five alternative definitions of ownership and control are used: (i) the total proportion of shares held by each category of owner⁸, (ii) the largest stake of all ownership stakes, (iii) the Herfindahl index of the largest 3 stakes held by each category of owner, (iv) the Shapley values of the largest shareholder and (v) the Shapley values for each category of owner.

High and low levels of ownership or control are subjective notions as the levels depend upon the distribution of ownership in the company. The Herfindahl index succeeds in capturing

⁷ In that case, a coalition owning more than 15% of the shares is required to disclose its ‘strategic intention’ or, if it controls 30% or more of the votes, the Mergers and Monopolies commission may require the coalition to comply to the mandatory take-over rule (Stapledon 1996).

⁸ In the UK, the percentage of equity held by a shareholder usually equals his or her percentage of votes (one-share-one-vote) since the London Stock Exchange has discouraged the use of multiple voting shares (Goergen and Renneboog 2000) and since ownership cascades are, in contrast to in most Continental European countries, rare.

the dispersion of ownership across shareholders and the relative power of a group of shareholders but does not reflect the relative voting power of individual shareholders. For example, if three shareholders own 40%, 40% and 20% respectively of a company's equity, the Herfindahl of the 3 largest shareholdings is 0.36. Shapley values (SV's) can be used to measure the relative importance of a shareholder in forming winning voting coalitions (Rydqvist 1998). In our example, each shareholder's SV is 0.33 because each is pivotal in coalitions yielding more than 50% of the control rights.

Including SV's instead of ownership percentages or Herfindahl indices allows us to test a dual hypothesis. Not only do we test the impact of the presence of large shareholders on the investment-cash flow relation tested but we also test whether this relation is influenced by coalitions of shareholders rather than individual large shareholders. A stronger statistical relation between SV's and investment than between percentages of ownership and investment may be interpreted as indirect evidence of shareholder-coalition formation.⁹ Within a framework of co-operative games – with transferable utility – in characteristic functional form, Shapley (1953) developed 'Shapley value assignment' ϕ defined as follows (Felsenthal and Machover 1998):

$$\phi_a(\mathbf{w}) =_{\text{def}} \frac{1}{n!} \sum_{X \subseteq N} (|X|-1)!(n-|X|)! (\mathbf{w}X - \mathbf{w}(X - \{a\}))$$

and game \mathbf{w} is a real-valued function whose domain is the power set (the set of subsets) of N (a non-empty finite set) such that $\mathbf{w}\emptyset=0$. Any member of N (the grand coalition of \mathbf{w}), a , is a player of \mathbf{w} . If X is a coalition, the real number $\mathbf{w}X$ is called the worth of X in \mathbf{w} .

In the UK, the disclosure threshold for shareholders other than directors is 3%. In the average quoted company, 56% of the equity capital is formed by stakes below the disclosure threshold. We assume that these stakes are owned by – de facto small – shareholders who free ride on corporate monitoring as their shareholdings are too small to internalise the cost of corporate control. Therefore, the free float is assumed not to be involved in monitoring the management and not to form voting coalitions. In practice, it is difficult to organise minuscule share stakes into voting blocks (Chung and Kim 1999).¹⁰ Consequently, rescaling the sum of the

⁹ Interesting studies relating voting power (measured by power indices) and performance are those by Leech (1988, 1991) who uses probabilistic indices for the UK and by Zwiebel (1995) for the US.

¹⁰ During protracted hostile take-over battles, coalitions of large shareholders may solicit votes of atomistic shareholders to buttress the coalition, but management removal seems to be more the competence of large shareholders due to free riding behaviour of small shareholders.

disclosed share blocks to 100% is a fair assumption. The resulting SV's reflect the relative voting power whereby a winning coalition is expected to reach absolute control (50%+1 vote of the rescaled vote).¹¹

All potential pacts are simulated by company and by year and the SV's measure the extend to which shareholders are pivotal in (potential) voting pacts. This assumes that every blockholder has an equal propensity to take part in a voting pact and to monitor the firm. However, it is possible that the relative power is better described as the result of a voting game consisting of two stages. It may be easier for specific classes of shareholders to form *ex ante* coalitions during the first stage before entering in a voting game as a block during the second stage.

For example, given that executive directors as a group have similar private benefits of control, they may combine their shareholdings to form one block and try to obstruct actions by other shareholders (e.g. attempts to remove executive directors). Evidence of managerial entrenchment in the UK is given by Lai and Sudarsanam (1997) and Franks et al. (1998). In this 'two staged' case, equity stakes of the executive directors are first added and, subsequently, the relative voting power of this aggregate block is calculated. As there is some evidence that non-executive directors support incumbent management (Franks et al. 1998, Berger et al. 1999), it is possible that the executive and non-executive directors forge a joint coalition such that the SV of all their combined stakes should be computed.

Examples of private benefits of control which can be reaped by (coalitions of) industrial companies owning large shareholdings by means of influencing the transfer pricing policy or expropriation of corporate opportunities¹² are discussed in Johnson et al. (2000). Some surveys (e.g. PIRC 1999 and Mallin 1996) provide some justification for the calculation of SV's for aggregate blocks held by coalitions of institutions. As different types of institutional investors meet regularly through associations such as the National Association of Pension Funds, coalition formation among (types of) institutions may be facilitated.

¹¹ There are a few cases where a shareholder who owns only a small share stake is given a disproportionately large relative voting power. For example, when the sole large shareholder holds 3% of the shares, he receives a SV of 1. In order to avoid this problem, companies with only one shareholder owning an equity stake of less than 5% and companies with 2 shareholders each owning less than 5% are excluded, where 5% is an arbitrary threshold. This results in removing 3% of the observations.

¹² An example of expropriation of opportunities: the French holding company Suez/Lyonnaise des Eaux which is active in utilities (e.g. energy, water, waste recycling etc) owns a substantial share stake in Tractebel, a Belgian electricity which has pursuing an aggressive worldwide growth strategy with operations in Latin-America, former Soviet Union etc. As Suez/Lyonnaise des Eaux has electricity subsidiaries which may also attempt to expand internationally, it seems that Tractebel's radius of action has been curtailed.

The rationale of forming coalitions among shareholders from specific ownership classes may justify the calculation of SV's (relative voting power) for each class of owners (after having aggregated all shareholdings by investor class). Further evidence of similar private benefits of control within shareholder classes is presented for the US by Barclay and Holderness (1989, 1991). These studies revealed that blocks were priced, on average, at substantial premiums of 20% and that these premiums differed according to the acquirer's ownership class. The fact that different classes of owner have different abilities to extract control rents is also empirically supported for the US by Demsetz and Lehn (1985) and Holderness and Sheehan (1988).¹³

3. Data description and methodology.

3.1 Sample selection.

A sample of 250 companies was randomly selected from all the companies quoted on the London Stock Exchange in 1988. Financial institutions, estate companies and insurance companies were excluded. A data panel was constructed for the period 1988-1993. The reason for the relatively short time series is that ownership data had to be collected by hand from company reports. The recession period of 1988 to 1993 was chosen during which corporate liquidity constraints may be more severe. Seven of the 250 companies were dropped because accounting data were not available from Datastream. Only those companies with a minimal panel of four years were retained in order to allow for a dynamic analysis. As a result, companies delisted through take-overs or insolvencies between 1988 through to 1991 were therefore excluded, but those that were delisted after 1991 were included in the analysis. Subsequent to 1991, 29 of the sample companies were acquired and 5 were liquidated or entered a formal bankruptcy process. The pattern of ownership is not significantly affected by recent IPOs (where insider ownership is particularly high) because 71% of the sample firms had been listed for at least eight years.¹⁴

¹³ Banerjee et al (1997) for France and Renneboog (2000) for Belgium show that the private benefits and reasons for control accumulation by holding companies – which are the largest shareholders in France and Belgium - are manifold: capturing tax reductions by facilitating intercompany transfers, reducing transaction costs by offering economies of scale or by supplying internal sources of funds.

¹⁴ See Goergen 1998 and Goergen and Renneboog 1999 for a discussion about the evolution of ownership in IPOs.

3.2 Data sources, variable definitions and data description.

As the B&M model is the model underlying the investment and liquidity relation, data for the model were collected using the same variable definitions and the same Datastream codes as the ones used by Bond and Meghir (1994a). In equation (5), Gross Investments (I) is defined as purchases of fixed assets and fixed assets acquired through take-overs. Cash flow (CF) is the sum of the provision for depreciation of fixed assets and operating profit before tax, interest and preference dividends. Sales (S) are total sales and Debt (L) is total loan capital consisting of all loans repayable in more than one year. Dividends (D) are ordinary dividends net of Advance Corporation Tax. Capital stock (K) is the sum of the gross book values of plant and machinery, and land and buildings. New Share Issues are collected from the London Share Price Database. Table 1 shows the evolution of investment and cash flow standardised by sales. The data reflect a the start of a recession with investment (on sales) reduced from 15.9% to 6% and cash flow (on sales) decreasing from 14.7% to 11.6%.

[Insert table 1 about here.]

Ownership data on the size of shareholdings both for existing and new shareholders for each year in the period 1988-1993 were collected from annual reports. All directors' holdings greater than 0.1% are included as well as other shareholders' stakes of 5% and more (until 1989) and of 3% and above (from 1990 when the statutory disclosure threshold was reduced to 3%). The status of the directors (executive/non-executive) and the dates of joining and leaving the board were also obtained from the annual reports. Non-beneficial share stakes held by the directors on behalf of their families or charitable trusts were added to the directors' beneficial holdings. Although directors do not obtain cash flow benefits from these non-beneficial stakes, they usually exercise the voting rights.

Shareholdings were classed into the following categories: (i) institutions, consisting of funds managed by banks, by insurance companies, by estate firms, by government agencies and consisting of investment/pension funds, (ii) industrial and commercial companies, (iii) families and individuals (not directly related to any director), (iv) executive directors, and (v) non-executive directors. Directors and their families, categories (iv) and (v), are referred to as 'insiders' whereas categories (ii) and (iii) are labelled as 'outside' shareholders. The identity of the owner of substantial shareholdings labelled as 'nominees' was collected from the company secretaries who were contacted by fax. In 96% of these cases, the shareholder behind the nominee company is an institutional investor. We attempted to collect data on shareholder attendance and vote casting for

a subsample of companies. The attempt failed as some companies only allowed these data to be consulted on their premises or were not able to disclose historical data on voting.

[Insert table 2 about here.]

Table 2 describes ownership concentration over the period 1988-1993. The mean across time for the largest shareholding amounts to 16.6%. The sum of all disclosed shareholdings is 39.1% .¹⁵ The Herfindahl index of all shareholders amounts to 0.36 and thus reflects the wide distribution of shareholdings across large shareholders (of which there are about 6 in the average company). Panel A also shows the relative voting power of the largest shareholder with a Shapley value of 0.58. The increase in the number of shareholders from 4 in 1989 to 6 in 1990 results from the decrease in the ownership disclosure threshold from 5 to 3%. Panel B shows the average stake by category of owner. Institutions own the largest cumulative equity stakes (24.4%), but they also have the highest frequency in the average firm. Industrial companies, directors and individuals or families own relatively larger shareholdings. Panel B also reports the Shapley values of the largest shareholder as well as that of aggregate stake of each category. If all institutions were to collude to cast their votes as a block, they would be the most powerful investor group with a SV of 0.62 compared to the board which has a SV of only 0.31. Panel C shows the percentage of companies which may have financing needs: they are financially distressed, have an interest coverage below two, reduce or omit dividends or issue rights.

There are two main approaches to test the investment-cash flow relation. The sample can be partitioned by a variable expected to reflect financing constraints (e.g. a low dividend pay out ratio) and the models are subsequently run for each sub-sample (e.g. Kadapakkam et al. 1998). Alternatively, the model is estimated for the entire sample with the inclusion of interactive terms, each consisting of a dummy variable set to one if the firm's ownership or financial situation satisfies a certain criterion (e.g. Gugler 1999). The advantage of the latter method is that the ownership concentration and financial status of the sample firms are not restricted into one single subsample over the whole period, but are allowed to vary over time and hence move from one category or subsample to another. Cleary (1999) discusses the advantages of such a time-varying approach.

¹⁵ The reduction in the largest equity stake and the sum of shareholdings is due to the fact that the number of firms in the last few years of the sample period is smaller as a result of bankruptcies and take overs.

The time-varying variables used to interact with the variables in equation (5) are defined as follows:

- $L_{category}^i$ = 1 if the largest share stake is held by a shareholder of categoryⁱ;
- $T_{category}^i$ = 1 if the sum of all shareholdings owned by shareholders of categoryⁱ is higher than the total percentage of equity held by each other category of shareholders;
- $H_{category}^i$ = the Herfindahl index of the 3 largest stakes held by shareholders of categoryⁱ.
- $SV_{category}^i$ = the Shapley value of the sum of all shareholdings of categoryⁱ, reflecting whether this category of shareholders is pivotal in potential coalitions with other classes of shareholders.
- Financing needs = 1 if more than one (the median value for the sample was one) of the following 5 conditions (each of which might indicate liquidity constraints) are fulfilled: the firm files for bankruptcy, new equity is issued in the form of a rights issue,¹⁶ the firm omits dividend payments, the firm decreases dividend payments, or the firm has an interest coverage of less than 2.

where $i =$

- executive directors;
- all the directors (inside shareholders);¹⁷
- outside shareholders (defined as industrial company or an individual or family);
- industrial or commercial companies;
- institutional investors (bank managed funds, investment and pension funds, funds managed by insurance companies).

3.3 Methodology.

A panel over a six year-period (1988-1993) was collected to capture dynamic adjustment processes and to control better for the effect of omitted variables (Hsiao, 1986). If there are unobserved fixed effects, dynamic OLS models provide biased and inconsistent estimates because the error term will be correlated with the explanatory variables. In this case, the coefficient on the lagged dependent variable suffers from an upward bias. One of the characteristics of our sample is that, although the firms are randomly selected, they are selected from a non-random population, i.e. the companies listed on the London Stock Exchange. This can be controlled for by allowing

¹⁶ Goergen and Renneboog (2000) report that if a UK company issues new equity for more than 3% of the market value of equity, it has to use a rights issue in order to preserve the rights of the existing shareholders.

¹⁷ Franks et al. (1998) and Faccio and Lasfer (2000b) cast doubt on the independence of non-executive directors, as advocated by the Cadbury Commission in 1992 and subsequent UK corporate governance commissions. They find that non-executive directors support the incumbent management even in the wake of poor performance.

for fixed effects.¹⁸ In addition, Meghir (1988) shows that using a fixed effects estimation takes care of the attrition bias resulting from non-random exit from the sample.

The Within Groups-OLS (WGOLS) allows for the elimination of the fixed effects (ϕ_i) in the error term by taking the deviations from the time mean. This method focuses on time series variation and omits cross-sectional variation. However, in equation (5), unless the number of time periods is high, $(I/S)_{i,t-1}$ will be strongly correlated with $\varepsilon_{i,t-1}$ in the time mean of ε_i as:

$$\left(\frac{I}{S}\right)_{i,t-1} = a_1 \left(\frac{I}{S}\right)_{i,t-2} + a_2 \left(\frac{I}{S}\right)_{i,t-2}^2 + a_3 \left(\frac{CF}{S}\right)_{i,t-2} + a_4 \left(\frac{D}{S}\right)_{i,t-2} + f_{t-1} + j_i + e_{i,t-1} \quad (5')$$

As a result the estimate of the coefficient on the lagged dependent variable will be heavily downward biased.

For a short and unbalanced panel, a more efficient method was developed by Arellano and Bond (1991). Their procedure consists in taking the first differences of the model and then applying the Generalised Method of Moments (GMM_{diff}), using the lagged levels of the dependent variable and the independent variables as instrumental variables. By taking first differences, the fixed error term ϕ_i is eliminated. Given that the shocks $\varepsilon_{i,t}$ are not serially correlated, the lagged levels dated $t-2$ and earlier of the dependent variable and the independent variables can be used as instruments to obtain a consistent estimator. The advantage of the Arellano-Bond technique over other methods – such as the widely used Anderson-Hsiao (1982) procedure – lies in its efficient use of available instrumental variables.

However, Blundell and Bond (1998) have shown that when the period of study is relatively short the GMM_{diff} estimation procedure performs poorly in two situations. The first situation is where the coefficient on the lagged dependent variable (α_1) is close to unity and the second situation is where the relative variance of the fixed effects (ϕ_i) is large. In these situations, the lagged levels of the variables are weak instruments and GMM_{diff} provides a downward-biased estimate of a_1 , the coefficient on the lagged dependent variable. Using Monte Carlo simulations, Blundell and Bond (1998) show that in these situations the Generalised Method of Moments in system (GMM_{sys}) provides better estimators than GMM_{diff} . The system consists of two types of equations, each of which has its own instruments. The first type of equations is in levels and their instruments are the lagged differences in the dependent variable and the independent variables.

¹⁸ Another example of fixed effects bias is that firms in the South of England may on average invest more than firms in the North of England even when controlling for industry.

The second type consists of equations in first differences with the levels of the dependent variable and the independent variables as instruments. All the models were estimated using the 1997/98 version the Arellano and Bond (1988) Dynamic Panel Data (DPD)-programme written in GAUSS.

For each estimation we report (i) the p-values for the tests on first-order correlation (m_1) and second-order correlation (m_2) in the residuals, (ii) the p-value for the Sargan test and (iii) the p-values for the parameter estimates, based on standard-errors asymptotically robust to heteroskedasticity. If m_1 is significant, then the instruments dated $t-2$ are not valid, but later instruments such as $t-3$ and $t-4$ may still be valid. Likewise, if m_2 is significant, then the instruments dated $t-3$ are not valid, but later instruments such as $t-4$ and $t-5$ may be.

The Sargan (1958) test is used to determine the valid instruments for each model and detect over-identifying restrictions. Under the null hypothesis of valid instruments, it is asymptotically distributed as a $\chi^2(n)$ with n degrees of freedom.

4. Results.

The basic B&M model was estimated using the three different estimation techniques: OLS, GMM_{diff} and GMM_{sys} . Table 3 shows that only for the model estimated with GMM_{sys} (column iii) dynamics of the structural adjustment costs of B&M model are not rejected and the size, sign and significance of the explanatory variables are in line with the theoretical predictions and the empirical results of the B&M model. As expected, the coefficient of the lagged dependent variable is close to 1 while the coefficient of the squared lagged dependent variable is negative and close to 1 (Bond and Meghir 1994a). Both OLS and GMM_{diff} provide biased estimates.

[Insert table 3 about here.]

Theoretically, an insignificant cash flow coefficient is expected as a company should be able to pursue its investment policy regardless of the amount of internally generated funds and as the company should be able to attract as much external capital as needed to finance positive NPV projects. However, the negative cash flow coefficient reflects that for the random sample of companies there is neither an overinvestment nor an underinvestment problem because companies do not invest more when their generated cash flow is large nor do they invest less when the internally generated funds are low. The negative relation between investment and cash flow may

however result from the fact that the time window captures a recession in the UK.¹⁹ The results obtained from the OLS estimation in column (i) may also be substantially different from their expected values due to first-order serial correlation. The fact that m_1 is highly significant for the OLS estimation is worrying as the t-tests will no longer be valid. If the t-tests are still used in the presence of (first-order) serial correlation, this may lead to the wrong conclusions about the significance of the coefficients (Gujarati 1995, p.411).

[Insert table 4 about here.]

Table 4 investigates the impact of financing needs on investment spending with financing needs being defined as a company issuing new equity, reducing dividend payments, omitting dividends²⁰, suffering from financial distress (filing for bankruptcy) or has an interest coverage of less than 2. The interaction term with cash flow shows that the investment spending of companies with financing needs is almost three times as sensitive to the availability of cash flow liquidity constraints as firms without financing needs. This is evidence that companies with financing needs suffer from underinvestment and it leads to the rejection of hypothesis 1 stating that internal funds do not influence a firm's investment policy. Table 4²¹ also reports the impact of the combined voting rights concentration held by institutions on the investment-cash flow relation. Whereas, in the absence of institutional holdings, investment spending is sensitive to the presence of internally generated funds, this sensitivity disappears for companies with high levels of institutional ownership (the coefficient of the cash flow term and the one of the interacting cash flow term cancel out). This suggests that institutional shareholders may somehow reduce suboptimal investment spending. This finding rejects hypothesis 3.²² Furthermore, the negative debt coefficient and the positive cash flow coefficient point out that a high level of leverage leads

¹⁹ The models in tables 3-6 include time dummies, as well as industry dummies interacting with the time dummies. The time dummies interacting with the industry dummies control for trends in the (I/S) series, which may be particular to certain industries and are not captured by the simple time dummies.

²⁰ It may be that a company with positive NPV projects cuts dividends in order to utilise its internally generated funds more. However, as there is ample empirical evidence of the rigidity of a downward adjustment of dividends, we do not consider these (marginal cases).

²¹ It should be noted that it was not possible to test the hypotheses simultaneously by including them in one model because of the limited time series and the number of lagged instrumental variables used.

²² However, this finding was not found to be robust as including the relative power of the institutional shareholder category (Shapley value) did not yield statistically significant results. In addition, including the largest institutional shareholder rather than the sum of all institutional share stakes did not yield significant results. Given that a single institution only holds a relatively small share stake, this suggests that only when institutions only have an impact on investment spending when they control a large percentage of voting rights.

to a reduction of investment as bond market and banks require high premia to compensate for the bankruptcy risk if internally generated funds do not suffice for investment spending.

[Insert table 5 about here.]

Table 5 shows the results for the investment-cash flow model with the interaction terms reflecting the ownership and control power of industrial companies.²³ A priori, one would expect more concentrated outside control to lead to a better investment policy for two reasons. First, the management's inclination to overinvest would be curbed as a result of closer monitoring. Second, management would underinvest less because asymmetric information may be reduced as a result of the existence of large outside shareholders. Control concentration is captured by four variables: a dummy variable indicating whether or not an industrial company controls the largest equity stake, a dummy variable indicating whether the category of industrial companies holds a larger combined shareholder than any other category, the percentage of the Herfindahl index of the largest three industrial shareholdings and the relative control power (SV) of industrial companies. The models reported in table 5 show that at low levels of control concentration held by industrial companies, there is no relation –apart from model ii- between investment spending and cash flow. When the category of industrial companies has high relative control power (SV in model iii) and when this control power is concentrated in the hands of just a few industrial companies (as measured by the Herfindahl in model ii), a strong positive relation at high levels rejects hypothesis 2 and suggests that powerful industrial shareholders seem to be able to stimulate investment spending when the company has high (free) cash flow or restrict investments when the internally generated funds are low. The former action may result from the fact that industrial companies can extract private benefits of control from concentrated ownership. Examples of tunnelling are given in Johnson et al. (2000) show that tunnelling – defined as e.g. investment in assets subsequently sold or leased to a controlling shareholder, transfer pricing advantageous to the controlling shareholders, loan guarantees granted to the controlling shareholder, expropriation of corporate opportunities - is seldom penalised by courts. The fact that the models capturing that an industrial company controls the largest equity stake and that industrial companies combined own the largest equity stake (model i) do not yield significant results in contrast to models (ii) and (iii) do, provides some indirect evidence that it is a coalition of industrial companies which influences the

²³ Combining the dummy for the financing needs with voting power variables into one model failed due to the irreversibility of the estimation matrix in the GMM method. This is the consequence of fact that the time series is short and that several lags are used as instruments.

investment policy but only if the control power is concentrated in the hands of few industrial companies.

[Insert table 6 about here.]

The impact of voting rights concentration in the hands of management (executive directors) is analysed in table 6. At low managerial ownership, there is no positive relation between investment spending and cash flow availability and hence no evidence of consistent over- or underinvestment. High levels of internally generated funds even lead to reduced investments. However, if executive ownership is high and is highly concentrated among a small number of executive directors (measured by the ratio of Herfindahl indices in model (iii)), investments increase with the level of cash flow. This suggests that at high levels of managerial ownership – when management is insulated from monitoring and is entrenched – overinvestment may result when internally generated funds are high.

5. Conclusion.

The empirical literature documents that the level of internally generated funds significantly influences investment spending. The positive cash flow sensitivity of investments can result from excess cash flow which management perceives to be too inexpensive and therefore squanders in negative NPV projects. In contrast to such agency problems, the positive relation may also be the consequence of liquidity constraints which cause the company to pass up valuable investment projects if the premium paid for external financing is high. This paper has investigated this relation for a random sample of companies listed on the London Stock Exchange and has analysed whether the cash flow sensitivities differ for companies with financing needs and for companies with varying degrees of ownership control. To this end, the Bond and Meghir (1994a) model, which overcomes some of the drawbacks of neo-classical and Tobin's q investment models, was extended. In addition, the models were estimated using the GMM in systems technique which avoids the estimation biases of usual methods (like weighted least squares, GMM in differences).

For the whole sample, there was no evidence of a positive relation between the levels of internally generated funds and subsequent investment spending, or no evidence of consistent over- or underinvesting. However, companies with financing constraints seem to underinvest since their investment spending is strongly and positively related to the amount of internally generated funds. For companies in which institutions own a large amount of the voting rights, the relation between investment spending and cash flow is reduced. Whereas for companies without large share stakes controlled by industrial companies investment is not cash flow dependent, the presence of voting

control by industrial companies induces a positive relation between cash flow and investment spending. This may result in either overinvestment – perhaps stimulated by industrial companies desiring to reap private benefits of control by tunnelling – or from underinvestment if these large shareholders reduce the company's intention to attract external funding. Given that in the absence of concentrated control by industrial companies, investment spending does not depend on cash flow levels, the first interpretation seems the most plausible one.

As cash flow sensitivity is only observed for models where industrial ownership is captured by SV's or Herfindahl indices, it seems that coalitions of a few industrial shareholders have an impact on investment policy rather than individual shareholders. Finally, whereas investment spending does not depend upon on the availability of cash flow, at high levels of managerial ownership managerial entrenchment seems to lead to overinvestments.

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Table 1: Descriptive statistics for the financing variables			
	I/S	CF/S	D/S
1988	0.159	0.147	0.100
1989	0.129	0.173	0.122
1990	0.084	0.117	0.111
1991	0.057	0.104	0.110
1992	0.051	0.097	0.119
1993	0.059	0.116	0.137
Average	0.091	0.126	0.071
Standard deviation	0.275	0.232	0.417
Observations	1004		

Source: own calculations. Data from Datastream.

Table 2: Descriptive statistics of ownership and control**Panel A : Evolution of ownership percentages and control distribution across shareholders.**

	Year	1988	1989	1990	1991	1992	1993	Mean
Largest shareholder	% Ownership	18.9%	18.2%	17.3%	16.1%	15.3%	13.9%	16.6%
Largest shareholder	Shapley value	0.68	0.68	0.55	0.50	0.50	0.56	0.58
All shareholders	% Ownership	37.6%	36.4%	42.4%	43.6%	41.1%	33.7%	39.1%
All shareholders	Herfindahl	0.46	0.45	0.32	0.29	0.29	0.34	0.36
Average number of shareholders per co.		3.77	3.92	6.08	6.62	6.44	5.45	
Total number of investors in all co's		840	879	1429	1549	1327	839	
Number of sample co's		223	224	235	234	206	154	

Panel B : Ownership, Shapley Values and Herfindahl Indices by category of owner.

1992	Shareholder	Numb. of co's (1)	%Owner-ship (1)	%Owner-ship (2)	Shapley value (1)	Shapley value (2)	Herfin-dahl (1)	Herfin-dahl (2)
Total Institutions	Largest	187	9.2%	8.4%	0.32	0.29		
	Sum	187	24.4%	22.4%	0.68	0.62	0.18	0.16
Industrial companies	Largest	86	12.8%	5.4%	0.34	0.14		
	Sum	86	14.3%	6.0%	0.36	0.15	0.13	0.06
Families and individ.	Largest	31	10.7%	1.6%	0.19	0.03		
	Sum	31	16.4%	2.5%	0.27	0.04	0.07	0.01
Executive directors	Largest	103	8.1%	4.1%	0.16	0.08		
	Sum	103	11.6%	5.9%	0.21	0.11	0.07	0.04
Non-executive directors	Largest	58	10.3%	2.9%	0.21	0.06		
	Sum	58	14.5%	4.1%	0.26	0.07	0.08	0.02
Total directors	Largest	118	10.1%	5.8%	0.21	0.12		
	Sum	118	17.3%	10.0%	0.31	0.18	0.10	0.06

Panel C : Evolution of financing needs and relative voting power over time.

	Year	1988	1989	1990	1991	1992	1993	1988-93
Financing needs (3)	% of sample co's	4.68%	8.47%	15.47%	15.22%	11.66%	28.91%	13.45%

- (1) Averages are calculated over the number of companies with shareholdings of that specific shareholder category.
- (2) Averages are taken over the total number of sample companies (including those companies lacking a shareholder of a specific shareholder category). The averages are calculated for the total the number of sample companies (204).
- (3) Panel C gives the percentage of the sample companies with financing needs. A company is considered to be in 'financing need' when it issues new equity, reduces dividend payments, omits dividends, has an interest coverage of less than 2 or is financially distressed (files for bankruptcy).

Table 3: Basic Euler-equation model estimated using (i) OLS, (ii) GMM_{diff} and (iii) GMM_{sys}.

(a). $(I/S)_{i,t}$ is the dependent variable in each model. (b) Each model contains time dummies and industry dummies. (c) m_1 and m_2 are tests for the absence of first-order and second-order correlation in the residuals respectively. These test statistics are asymptotically distributed as $N(0,1)$ under the null of no serial correlation. (d) The Sargan test statistic is a test of the over-identifying restrictions, asymptotically distributed as $\chi^2(k)$ under the null of valid instruments, with k degrees of freedom reported in parentheses. (e) Model (i) is OLS in levels. Model (ii) is the model in first differences with levels dated $t-3$ and $t-4$ of the dependent and independent variables as instruments. Model (iii) is a linear system of first-differenced and levels equations. The instruments are levels of $(I/S)_{t-1}$, $(I/S)_{t-1}^2$, $(CF/S)_{t-1}$, $(D/S)_{t-1}^2$, $IA*(I/S)_{t-1}$, $IA*(I/S)_{t-1}^2$, $IA*(CF/S)_{t-1}$, and $IA*(D/S)_{t-1}^2$ dated $t-4$ for the differenced equations and first differences dated $t-3$ for the levels equations. (f) p -values, based on standard-errors asymptotically robust to heteroskedasticity, are reported in parentheses. ***, ** and * stand respectively for statistical significance within the 1%, 5% and 10% confidence levels.

Variable	(i) OLS	(ii) GMM _{diff}	(iii) GMM _{sys}
Constant	0.095*** (0.000)	-0.039 (0.835)	0.106 (0.135)
I/S_{t-1}	0.486*** (0.000)	0.608* (0.055)	0.821** (0.014)
$(I/S_{t-1})^2$	-0.067*** (0.000)	-0.101 (0.667)	-0.998* (0.075)
CF/S_{t-1}	-0.120* (0.095)	-0.215 (0.454)	-0.232** (0.030)
$(D/S_{t-1})^2$	0.029 (0.431)	-0.212 (0.132)	0.031** (0.036)
p-value of m_1	0.022	0.035	0.169
p-value of m_2	0.009	0.699	0.972
p-value Sargan test	—	0.790	0.172
Observations	814	633	790

Table 4: Investment model with financing needs.

(a). $(I/S)_{i,t}$ is the dependent variable in each model. IA stands for interaction dummy and is to be replaced by the following dummy variables: (i) $Financing\ needs$ is a dummy variable, which is set to one if a company issues new equity, reduces dividend payments, omits dividends or is financially distressed (files for bankruptcy). (ii) $T_{institutions}$ is a dummy variable, which is set to one if the total proportion of shares held by institutional investors is at least a third of the total proportion of significant share stakes held in the firm. (b) Each model contains time dummies and industry dummies. (c) m_1 and m_2 are tests for the absence of first-order and second-order correlation in the residuals respectively. These test statistics are asymptotically distributed as $N(0,1)$ under the null of no serial correlation. (d) The Sargan test statistic is a test of the over-identifying restrictions, asymptotically distributed as $\chi^2(k)$ under the null of valid instruments, with k degrees of freedom reported in parentheses. (e) The models are a linear system of first-differenced and levels equations. For all the models the instruments are levels of $(I/S)_{t-1}$, $(I/S)_{t-1}^2$, $(CF/S)_{t-1}$, $(D/S)_{t-1}^2$, $IA * (I/S)_{t-1}$, $IA * (I/S)_{t-1}^2$, $IA * (CF/S)_{t-1}$, and $IA * (D/S)_{t-1}^2$ dated $t-4$ for the differenced equations and first differences dated $t-3$ for the levels equations. (f) p -values, based on standard-errors asymptotically robust to heteroskedasticity, are reported in parentheses. ***, ** and * stand respectively for statistical significance within the 1%, 5% and 10% confidence levels.

Variable	Financing Needs	$T_{institutions}$
Constant	0.200 (0.179)	0.156 (0.137)
I/S_{t-1}	0.933** (0.007)	0.485** (0.044)
$(I/S_{t-1})^2$	-0.401** (0.027)	-0.360*** (0.000)
CF/S_{t-1}	0.296* (0.085)	0.574** (0.020)
$(D/S_{t-1})^2$	-0.138 (0.140)	-0.028*** (0.000)
$IA * (I/S_{t-1})$	-0.676 (0.283)	0.963 (0.115)
$IA * (I/S_{t-1})^2$	0.413 (0.163)	-0.453 (0.153)
$IA * (CF/S_{t-1})$	0.889* (0.100)	-0.512* (0.068)
$IA * (D/S_{t-1})^2$	0.048 (0.505)	-0.034 (0.595)
p-value of m_1	0.366	0.669
p-value of m_2	0.196	0.313
p-value Sargan test	0.422	0.335
Observations	820	820

Table 5: Investment model with control power of industrial companies.

(a) $(I/S)_{i,t}$ is the dependent variable in each model. IA stands for interaction dummy and is to be replaced by the following: $T_{\text{industrial co's}}$ is a dummy variable equalling 1 if the total proportion of shares owned by industrial companies is higher than the total percentage of equity held by each other category of shareholders. $H\%_{\text{industrial co's}}$ is the Herfindahl index of the 3 largest stakes held by industrial companies. $SV_{\text{industrial co's}}$ is the Shapley value of the sum of the share stakes held by the industrial companies (combined). (b) Each model contains time dummies and industry dummies. (c) m_1 and m_2 are tests for the absence of first-order and second-order correlation in the residuals respectively. These test statistics are asymptotically distributed as $N(0,1)$ under the null of no serial correlation. (d) The Sargan test statistic is a test of the over-identifying restrictions, asymptotically distributed as $\chi^2(k)$ under the null of valid instruments, with k degrees of freedom reported in parentheses. (e) The models are a linear system of first-differenced and levels equations. The instruments are levels of $(I/S)_{t-1}$, $(I/S)_{t-1}^2$, $(CF/S)_{t-1}$, $(D/S)_{t-1}^2$, $IA * (I/S)_{t-1}$, $IA * (I/S)_{t-1}^2$, $IA * (CF/S)_{t-1}$, and $IA * (D/S)_{t-1}^2$ dated t-4 for the differenced equations and first differences dated t-3 and t-4 for the levels equations (except for the model with $T_{\text{industrial co's}}$ where the instruments for the levels equations are first differences dated t-4). (f) p-values, based on standard-errors asymptotically robust to heteroskedasticity, are reported in parentheses. ***, ** and * stand respectively for statistical significance within the 1%, 5% and 10% confidence levels.

Model	(i)	(ii)	(iii)
Variable	$T_{\text{industrial co's}}$	$H\%_{\text{industrial co's}}$	$SV_{\text{industrial co's}}$
Constant	0.114 (0.170)	0.840** (0.035)	0.204 (0.205)
$(I/S)_{t-1}$	0.400 (0.136)	0.383** (0.019)	0.564** (0.023)
$(I/S)_{t-1}^2$	-0.130 (0.383)	-0.114 (0.186)	-0.223 (0.354)
$(CF/S)_{t-1}$	0.039 (0.741)	0.207** (0.022)	-0.178 (0.542)
$(D/S)_{t-1}^2$	-0.002 (0.819)	-0.044 (0.118)	-0.022 (0.362)
$IA * (I/S)_{t-1}$	-0.831 (0.393)	-0.899 (0.213)	-0.589 (0.241)
$IA * (I/S)_{t-1}^2$	1.067 (0.202)	-1.926 (0.426)	0.050 (0.938)
$IA * (CF/S)_{t-1}$	0.860 (0.175)	1.051* (0.092)	1.455* (0.051)
$IA * (D/S)_{t-1}^2$	-0.435*** (0.001)	-0.808 (0.605)	-0.002 (0.983)
p-value of m_1	0.324	0.593	0.371
p-value of m_2	0.174	0.512	0.463
p-value Sargan test	0.413	0.752	0.170
Observations	814	814	814

Table 6: Investment model with control power of insider shareholders.

(a) $(I/S)_{i,t}$ is the dependent variable in each model. IA stands for interaction dummy and is to be replaced by the following dummy variables: $H\%_{executive}$ is the Herfindahl index of the 3 largest stakes held by executives. $H_{executive}$ is a dummy variable set to one if the ratio of the Herfindahl index of the 3 largest stakes held by executives over the Herfindahl index of the 3 largest stakes (whatever their owner) is higher than the median of the ratio for all the firms in that year. $SV_{executive}$ is the Shapley value of the sum of the share stakes held by executive directors (combined). (b) Each model contains time dummies and industry dummies. (c) m_1 and m_2 are tests for the absence of first-order and second-order correlation in the residuals respectively. These test statistics are asymptotically distributed as $N(0,1)$ under the null of no serial correlation. (d) The Sargan test statistic is a test of the over-identifying restrictions, asymptotically distributed as $\chi^2(k)$ under the null of valid instruments, with k degrees of freedom reported in parentheses. (e) The models are a linear system of first-differenced and levels equations. The instruments are levels of $(I/S)_{t-1}$, $(I/S)_{t-1}^2$, $(CF/S)_{t-1}$, $(D/S)_{t-1}^2$, $IA*(I/S)_{t-1}$, $IA*(I/S)_{t-1}^2$, $IA*(CF/S)_{t-1}$, and $IA*(D/S)_{t-1}^2$ dated $t-4$ for the differenced equations and first differences dated $t-3$ and $t-4$ for the levels equations (except for the model with $L_{executives}$ the instruments for the levels equations are first differences dated $t-4$). (f) p -values, based on standard-errors asymptotically robust to heteroskedasticity, are reported in parentheses. ***, ** and * stand respectively for statistical significance within the 1%, 5% and 10% confidence levels.

Model	(i)	(ii)	(iii)	(iv)
Variable	$L_{executives}$	$H\%_{executives}$	$H_{executives}$	$SV_{executives}$
Constant	0.096 (0.129)	0.876 (0.156)	-0.022 (0.866)	0.244 (0.264)
$(I/S)_{t-1}$	0.699*** (0.004)	0.517*** (0.006)	0.690*** (0.004)	0.649** (0.012)
$(I/S)_{t-1}^2$	-0.664** (0.018)	-0.161* (0.053)	0.021*** (0.000)	-0.420** (0.028)
$(CF/S)_{t-1}$	-0.222** (0.018)	0.054 (0.688)	-0.314*** (0.000)	0.491 (0.113)
$(D/S)_{t-1}^2$	0.035** (0.012)	-0.076** (0.028)	0.039*** (0.000)	-0.042*** (0.000)
$IA*(I/S)_{t-1}$	0.577 (0.613)	-0.084 (0.989)	-0.336 (0.140)	1.881** (0.026)
$IA*(I/S)_{t-1}^2$	-1.591 (0.644)	-4.057 (0.606)	-0.148 (0.504)	-2.299 (0.128)
$IA*(CF/S)_{t-1}$	0.100 (0.840)	1.670 (0.398)	0.252*** (0.009)	-0.712 (0.151)
$IA*(D/S)_{t-1}^2$	-0.301 (0.735)	0.815* (0.094)	-0.019 (0.580)	-2.971*** (0.007)
p-value of m_1	0.227	0.878	0.614	0.718
p-value of m_2	0.418	0.883	0.258	0.521
p-value Sargan	0.457	0.487	0.633	0.211
Observations	790	814	820	814